Ternary fission induced by polarised neutrons

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Both, for binary and ternary fission, parity conserving and parity non- conserving angular distributions of fission fragments have been studied in the last years. The experimental technique is based on the use of polarised cold neutrons in (n,f) fission reactions. From a comparison of the angular anisotropies of fragments for the two above modes of fission decay it can e.g. be learned when in the process the ternary light charged particles are formed. More recently, for ternary fission also triple correlations between the spin of the neutron inducing fission and the two momenta of the light fision fragment and the light charged particle have been investigated. Surprisingly, sizable correlations were discovered for the two fissile U-isotopes ^{233}U and ^{235}U. By contrast, in very recent experiments no such correlation could be disclosed for ^{239}Pu(n,f)as the target.

While the theory of the angular anisotropies under discussion is well established, the newly discovered triple correlation has not yet found a generally accepted interpretation. Several models have been proposed. An appealing suggestion is that, upon ejection of a ternary particle from the neck of a fissioning nucleus which is rotating, the Coriolis force will bring about the correlation observed. The size of the correlation should hence depend on the spin of the compound nucleus which is larger for the U-isotopes (2 to 4 Planck units) than for the Pu-isotope studied (0 or 1 Planck units). The smaller size of the effect being expected for ^{239}Pu could be the reason why the correlation has escaped detection in experiment.

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